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Post Office Box 6788 Fort Davis Station Washington, D. C. 20020	Declass Review by NGA.
Attention:	
Dear Sir:	
is pleased to	o submit its proposal P-188A as an addi- ich we submitted to you on 5 January 1968.
This option provides for	to furnish the digitizing
	) required for the fiber optic digitizer th the other furnished equipment into
option proposal is attached. The option is 180 days, due to the long proposal remains firm for 50 days.	
In the near future we will sub- to provide for aligning and leveling viewer to be used with this system.	
If you have any questions, ple	ease contact me or
	l .
JTK:gk	GROUP # S
JTK:gk  Attachment  NOTICE — THIS DOCUMENT / MATERIAL CONTAINS NFORMATION AFFICTING THE NATIONAL EFFENSE OF THE UNITED CTOTUS WINTER THE MEASURE OF THE ESPIONACE LIW , TITLL 17, U.G., SETTIONS 195 THE ENGLANCED OF THE THE THE THE THE THE TOP OF THE CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.	EXCLUSED FROM AUTOMATIC  COWNERABLE AND THE SECRETARION

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## TECHNICAL DATA

MODEL 50-1224

25X1

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Model	50-1224	Data	Acquisition	System

The Model 50-1224 Data Acquisition System consists of the following instruments:

- 1. One (1) eacl
- 2. Four (4) ead
- Model 2825B Control Panel
- Model 2826C Bi-Directional Counters
- 3. One (1) each Model 2827B Synchronizer
- 4. One (1) eacl Iodel 2030A Card Punch Coupler

Including system cables and hardware, no cabinets are provided. All instruments may be rack mounted.

This system counts input pulses received from four sources. Count information is then combined with manually coded information and transmitted in binary-serial form, through a Data-Phone link, to the central station, or to a card punch system.

Input pulses from four sources are applied to the four bi-directional counters 1 through 4. Each counter receives two inputs from its source: one representing forward count, the other representing reverse count. The counters totalize their respective input pulses algebraically and continuously, and register the accumulated count. Other information is selected manually on the control panel and in the synchronizer. At the discretion of the operator, the latest algebraic sum of each counter, along with the manually selected information, is scanned by the synchronizer and transmitted in binary-serial form, through the Data Phone link, to the central station. The central station examines the message for parity, and informs the data acquisition system of its findings. After the central station acknowledges receipt of the message, the next message may be transmitted at the discretion of the operator. An outgoing message may include data accumulated by counters 1 and 2, by counters 3 and 4, or by all four counters, as selected by the DATA switch of the scanner.

Following is a sequence of events occurring during a typical measurement cycle, with the outgoing message including data accumulated by all four counters:

- 1. Each counter is reset either to zero or to a preselected count, then starts to totalize from that point.
- 2. Information, other than pulse count, is selected manually.
- 3. The operator decides to send a message, and presses one of a group of pushbuttons on the control panel. At that instant, storage binaries in each counter lock in the latest count information, while the counting continues. The synchronizer sends a REQUEST TO SEND signal to the Data Phone Link.
- 4. The Data Phone link returns a CLEAR TO SEND signal.

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- 5. Scanning operation begins, and the first word of the message, START OF MESSAGE, is sent.
- 6. Next five words of the message are sent. These include a portion of the manual code selected on the front panel.
- 7. Next seven words of message are sent. These include polarity sign and six digits of count information contained in the storage binaries of counter 1.
- 8. Next seven words of message are sent. These include polarity sign and six digits of count information contained in the storage binaries of counter 2.
- 9. Next seven words of message are sent. These include polarity sign and six digits of count information contained in the storage binaries of counter 3.
- 10. Next seven words of message are sent. These include polarity sign and six digits of count information contained in the storage binaries of counter 4.
- 11. Next three words of message are sent. These include machine identification information, selected manually in the synchronizer.
- 12. Next ten words of message are sent. These include the remainder of the coded message selected on the control panel.
- 13. END OF TRANSMISSION word is sent.
- 14. Message parity word is sent.
- 15. Following end of message, one of three conditions may exist:
  - a. Message was received and found to be correct.
  - b. Message was received and found to be incorrect.
  - c. Message was not received.
- 15a. If correct message was received, an ACKNOWLEDGE signal is returned to the data acquisition system.

MODEL 50-1224.

- 15b. If message received by the central station was incorrect, an ERROR signal is returned to the data acquisition system. The system automatically sends another REQUEST TO SEND signal to the Data Phone link. When the CLEAR TO SEND signal is received, the system sends another, identical message. This procedure is repeated for three seconds or, until an ACKNOWLEDGE signal is received, whichever occurs first. If, at the end of three seconds, ACKNOWLEDGE signal is not received, an alarm is sounded. The system remains in the ALARM condition until reset manually.
- 15c. If message was not received by the central station, three seconds later an alarm is sounded. The system remains in the ALARM condition until reset manually.
- 17. Following receipt of the ACKNOWLEDGE signal, the storage binaries unlock and are slaved once again to the changing count. The next message is sent at the discretion of the operator.
- 18. If an ALARM condition exists, it is reset manually, the storage binaries unlock and are slaved once again to the changing count. After cause of error has been determined and corrected, the next message is sent at the discretion of the operator.

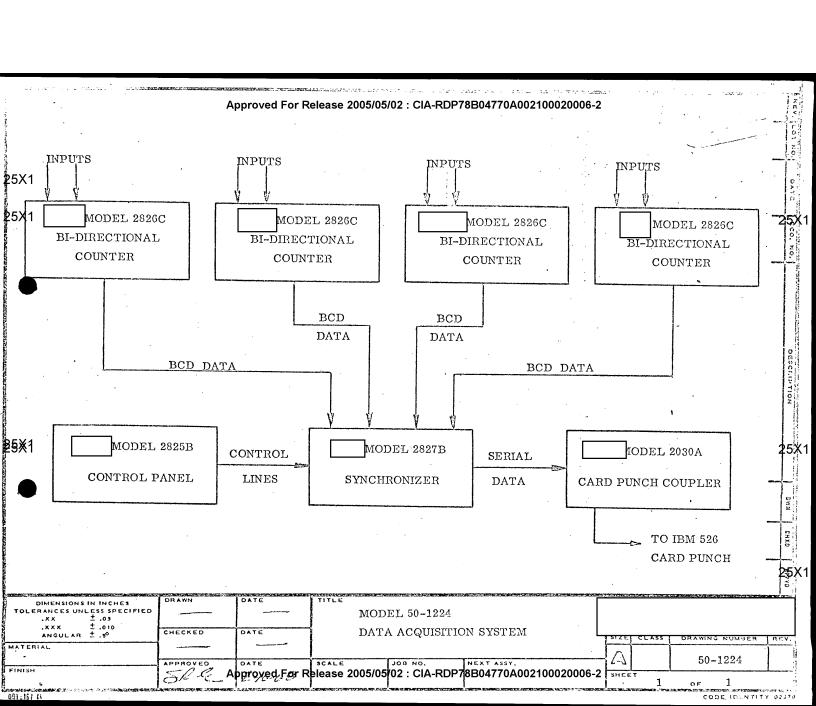
Input Power Requirements:

115 v  $\pm$  10%, 50-60 Hz, approximately 250 watts

Dimensions:

 $24^{\shortparallel}$  W x  $41^{\shortparallel}$  H x  $21\text{--}1/2^{\shortparallel}$  D (does not include

control panel)



MODEL 2825B

25X1

25X1

Model 2825B Control Panel

Model 2825B Control Panel contains switches for starting the transmission cycle, outside machine identification, and all manual code switches. In addition, the control panel indicates when a transmission is in progress and whether or not an alarm condition exists. The panel has the following controls, indicators and specifications:

INSTRUCTION CHARACTERS Switches: Illuminating pushbutton switches. Used to select four words of instruction character manual code.

TRANSMISSION LIGHT:

Green indicator lamp. Illuminates for three seconds when one of the READOUT CHARACTERS

switches is pressed.

ALARM RESET Switch:

Red illuminating pushbutton switch. Used to

reset alarm condition of system.

SPECIAL CHARACTERS Switches:

Eleven-position rotary switches. Used to select ten words of special characters manual code.

READOUT CHARACTERS Switches:

Illuminating pushbutton switches. Any one may be used to start transmission of message. If more than one are pressed simultaneously,

message will contain an error.

POWER REQUIREMENTS:

Power used by the control panel, which includes the lighting of illuminating switches, is supplied

by the synchronizer.

DIMENSIONS:

7" H x 19" W x 4-1/4" D

WEIGHT:

Approximately 7 lbs.

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MODEL 2826C

25X1

25X1

Model 2826C Bi-Directional Counter

Model 2826C Bi-Directional Counter has the following specifications:

Type of Count: Bi-Directional and non-complementary.

6 decimal digits and polarity sign. Registration:

Impulses with an algebraic sum of  $\pm 1 \times 10^6$ . Count Capacity:

Direction of Count: Normal or reversed.

A and B Input Signal Requirements

Amplitude: Positive-going level change from -6 v to ground.

Pulse Duration: 6 microseconds minimum.

Rise Time: 0.5 microsecond maximum.

Repetition Rate: 100,000 pps.

Maximum Duration Between Pulses

of Oppositive Direction: 10 μsec

Input Impedance:  $20,000 \Omega$ 

External Reset Input Requirements: Contact closure to ground.

Count Information Output to

Synchronizer: 7-line, parallel-series BCD; only 6 of the 7 lines

carry data.

Power Supplied to the Data Source: a. -18 v dc at 3.5 ma

b. +18 v dc at 18 ma c. -6 v dc at 7.5 ma d. 5 v ac at 240 ma

Termination: ENCODER POWER connector.

115/230 v rms, 50-60 cps, 40 w; instrument wired Input Power Requirements:

and fused at the factory for 115-v operation.

1.5-amp 3 AG slow-blow for 115-v operation; 3/4 Fuse:

amp 3 AG slow-blow for 230-v operation.

Dimensions: 5-1/4" H x 19" W x 12-1/2" D

Weight:

Approximately 30 lbs.

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MODEL 2827B

25X1

25X1

Model 2827B Synchronizer

The Model 2827B Synchronizer accepts input information in parallel-series form, adds its own data, and transmits the complete message in binary-serial form through a Data Phone link to the central station, or a card punch system. A rear panel switch selects whether the instrument is to be used with a Data Phone link or a card punch system. When this switch is set to PUNCH, the 120-kc clock frequency is supplied by the card punch system, and is gated off at the end of each word. This allows the slower card punch to remain in step with the message flow. When the CLOCK SELECT switch is set to COMPUTER, the clock frequency is supplied by the internal oscillator.

Input information is obtained from the four bi-directional counters and the control panel. The bi-directional counters supply count information through storage binaries; the control panel supplies code information that is selected manually by a network of switches. To this, the synchronizer adds internally-generated words such as START OF MESSAGE, END OF TRANSMISSION, parity and machine identifier. When a READOUT CHARACTERS switch is pressed on the control panel, the latest count information is locked in the storage binaries, a timer circuit in the synchronizer is initiated, and a REQUEST TO SENT signal is sent to the Data Phone link. Upon receipt of a CLEAR TO SEND signal from the Data Phone link, scanning operation begins. The complete message is transmitted, bit-by-bit to the central station. After transmitting the message, the synchronizer awaits an ACKNOWLEDGE or ERROR signal from the central station. If an ACKNOWLEDGE is received, the storage binaries are slaved once again to the continuously changing count. If an ERROR signal is received, scanning operation is resumed and the identical message is transmitted again to the central station. This procedure is repeated several times. If, within three seconds, an ACKNOWLEDGE signal is not received, the timer circuit actuates an alarm, indicating that the transmission was not successful. The alarm is reset manually and, after cause of failure has been determined and corrected, sending of another message can be attempted.

The scanning of words supplied by the control panel, of words generated in the synchronizer, and all bit scanning is performed in the synchronizer. The scanning of words supplied by the four counters is performed within each counter, with the sequence of counters controlled from the synchronizer.

A complete message is composed of 49 words (or 35, if only two counters are scanned), with each word containing 10 bits. It is transmitted in a burst of 490 (or 350) bits, at a rate of 1200 bits per second. Table 1 is a word-by-word breakdown of the message sent by the synchronizer, showing the order in which the words are transmitted, and the origin of the words. Table 2 is a bit-by-bit breakdown of a typical count information word, showing the order in which each bit is transmitted. Other words are similar in composition, with dummy bits replacing information bits, or vice versa.

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MODEL 2827B

For parity purposes, the message is arranged in a matrix of word rows and bit position columns. Each row has a word parity bit which, when added to the "1" bits of that row, makes the parity of that row odd. The last bit in each column is message parity bit which, when added to the "1" bits of that column, makes the parity of that column even. The sum of message parity bits is the message parity word, which is the last word in the message. The message parity word itself has its own word parity bit. This bit makes the parity of the message parity word odd, and is independent of the other word parity bits.

MODEL 2827B

SPECIFICATIONS

CLEAR TO SEND Input Requirements: Positive-going level change from -8 v to +8 v

RDL Input Requirements: 10-bit word, appropriately coded

(ACKNOWLEDGE and ERROR)

REQUEST TO SEND Output: Positive-going level change from -6 v to +6 v

1

Message Output Number of Wires:

Number of Words per Message: 46, plus START OF MESSAGE, END OF TRANS-

MISSION, and parity word.

Number of Bits per Word: 10

Bit Logic

Logical "0": +6 to +10 v

Logical "1": -6 v to -10 v

Word Parity (Lateral): Odd

Message Parity (Longitudinal: Even

Type of Transmission: Binary-serial

Rate of Transmission: 1200 bits/SEC + 1%

115/230 vac, +10%, 60 cps, 65 watts; Input Power Requirements:

instrument wired and fused at the factory

for 115-volt operation.

1.5 ampere, 3 AG slow-blow for 115v operation; Fuse:

3/4 ampere, 3 AG slow-blow for 230v operation.

Dimensions: 5-1/4" H x 19" W x 12-1/2" D

Weight: Approximately 35 lbs.

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WORD	TITLE	•	· · ·
WOND	THE	•	ORIGIN
1 2 3	START OF MESSAGE READOUT CHARACTER INSTRUCTION 1		Synchronizer Control Panel Switch
4			T.T. TT TT
5			TT
6	. 4		17 17 11
7	COUNTER 1 SIGN ( $\pm$ )		Counter 1
8	" 1 10 <sup>5</sup> DÌGIT		" 1
9	" $1.10^{4}$ "		'' 1
10	1 103 "		. " 1
11	". $110^2$ "	•	'' 1
. 12	1 101 "		" 1
13	" 1 100 "		" 1
14	COUNTER 2 SIGN ( $\pm$ )		" 2
15	'' 2 10 <sup>5</sup> DÌGIŤ		11 2
16	" $2 \cdot 10^{4}$ "		. 11 2
17	" 2 10 3 "		11 2
18	11 2 102 11		" 2
19	" $2 \cdot 10^{1}$ "		
20	" 2 100 "		2
21	" 3 SIGN (±)		11 3
22	" 3 10 <sup>5</sup> DÌGIT		<u>''</u> 3
23	" 3 10 <sup>4</sup> "		" 3
24	" 3 103 "	•	" 3
25 26	5 10		" 3
26 27	0.10		11 3 11 3
28 .	9 10		. •
29	" 4 SIGN (±) " 4 10 <sup>5</sup> DIGIT		. 34
30	" 4 10 <sup>4</sup> "		74
31	4 103 "		<b>4</b>
32	$4 10^2$ "		<b></b>
33	" 4 101 "		<b>T</b>
34	" 4 100 "		11 4 11 4
35	MACHINE I.D. 10 <sup>2</sup> DIGIT		Synchronizer Switch
36			ii ii ii
37	" " 100 "		11 11
38	SPECIAL CHARACTER 1	•	Control Panel Switch
39	11 11 2		ii ii ii
40	1 3		11 11 11
41	11 11 4		· ff ff ff
42	" " 5		11 11 11
43	SPECIAL CHARACTER 6		Control Panel Switch
44	11 11 7		11 11 11
45	11 11 8		11 11 11
46	11 11 9		11 11 11
47	" " 10		11 11 11
48 .	END OF TRANSMISSION		Synchronizer
49	MESSAGE PARITY	,	11 .

TABLE 2 WORD FORMAT OF COUNTER 1  $10^4$  DIGIT

BIT POSITION	WEIGHT	CODE
1	MARK	START
2	20	BCD1
3	21	BCD2
4	$2^2$	BCD4
5	$2^3$	BCD8
6	$2^4$	DUMMY
7	. 2 <sup>5</sup>	DUMMY
8	26	PARITY
9	SPACE	Gm O Dr
10	SPACE	STOP*

<sup>\*</sup>Duration of one stop pulse is equal to two clock pulses.

MODEL 2030A

25X1

25X1

Model 2030A Card Punch Cou	
Model 2030A Card Punch Cou	pler

The Model 2030A Card Punch Coupler converts serial data into parallel-serial form, suitable for use by an IBM Model 526 Card Punch.

Input data is a 49-word (or 35-word, when 2-axis operation is selected), 490-bit message, applied to the instrument at the rate of  $1.2 \times 10^3$  bits per second. Rate control is derived from a 120-kHz clock frequency supplied by a crystal oscillator within the instrument. The clock frequency is gated off at the end of each word by a stop bit, allowing the card punch to complete its activities.

As the message arrives, it is applied, one word at a time, to a shift register within the instrument. From there it is transferred to storage, and punched when the cycle is initiated by the data source. When a word is punched, the card punch returns an emitter signal. The trailing edge of the emitter signal transfers the next word from the shift register to storage, and gates on the clock frequency. This procedure continues for the remaining portion of the message. When the last word of the message has been punched, the card punch removes the punch card, inserts a new card, and stops.

Following is a sequence of events occurring in the instrument during a typical 4-axis message cycle:

- a. A "request-to-send" signal is obtained from the data source, and returned by the instrument to the data source as a "clear-to-send" signal. Simultaneously, an "auto-start" level is applied to the card punch.
- b. First word of the message arrives; and is applied, bit by bit, to the 10-bit shift register. This word is accompanied by a "start-of-message" level, causing it to be shifted out of the shift register, and will not form part of the outgoing message.
- c. Second word of message arrives, and is applied to the shift register. From there it is transferred into storage.
- d. Third word of message arrives, and is applied to the shift register. At the end of the word the clock frequency is gated off, and the arrival of further data is halted temporarily.
- e. Emitter pulse is obtained from the card punch, and the stored word is punched. Note that this stored word, which was the second word of the incoming message, becomes the first word of the outgoing message.
- f. At the trailing edge of the emitter pulse, the third word is transferred from the shift register into storage, and the clock frequency is gated on.

MODEL 2030A

25X1

g. Words 4 through 49 are obtained from the data source and punched, as in steps d through f. The card punch removes the punched card, inserts a new card, and stops, ending the cycle. Another message is started upon receipt of a request-to-send signal from the data source.

#### SPECIFICATIONS

Data Input

. Data:

Serial message, consisting of 49 or 35 words, depending

on type of operation selected.

Number of bits per word:

10

Bit logic:

Logical "1":

-10 v to -12 v from a nominal source impedance of 3 ohms.

Logical "0":

+10 v to +12 v from a source impedance of 1 k.

Rate of transmission:

 $1.2 \times 10^3$  bits per second. Transmission controlled by

120-kHz gated clock frequency supplied by card punch

coupler.

Request to send input:

Positive-going level change from -12 v from source impedance of 1 k to +12 v from source impedance of

approximately 3 ohms.

Start of message input:

Positive-going level change from -12 v from source impedance of 14.7 k to 0 v  $\pm$  0.3 v from a nominal

source impedance of 3 ohms.

Stop input:

Same level change and source impedance as start of

message input.

Acknowledge Output:

Negative-going level change from  $0 \text{ v} \pm 0.3 \text{ v}$  from a nominal 3-ohm source impedance to -12 v from a 1-k

source impedance.

Data Output

Number of lines:

12

Code:

Alpha-numeric.

Level:

Same as emitter pulse input, gated on the appropriate

line.

Emitter Signal Input:

As supplied by the IBM Model 526 Card Punch.

Auto Start Output to Card Punch:

Form "A" relay contact closure.

MODEL 2030A

Input Power Requirements:

115 volts ac + 10% 50-60 Hz, approximately 50 watts.

Weight:

Approximately 30 pounds.

Dimensions:

5-1/4" H x 19" W x 12-1/2" D.

